SIMPLE FRACTURE OF THE CARPAL SCAPHOID.*

WITH A REPORT OF SEVEN CASES.

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IT is not intended that this paper shall treat exhaustively the subject of fracture of the carpal scaphoid, but its purpose is to call attention to the more important symptoms, the diagnosis and treatment of the uncomplicated injury in its recent state. The good result obtained in four of the seven cases herewith reported is unquestionably due to the fact that the diagnosis was made and the proper treatment instituted within a few hours after the fracture was received. While the force exerted at the time of the injury no doubt determines, in a large measure, the amount of displacement in the fragments, yet a failure to immobilize the wrist joint very early, might tend to change an otherwise favorable into an unfavorable case, for union with the fragments in good position is necessary in order to obtain the best results.

Of the seven cases upon which these observations are based, four were treated in the out-patient department of Bellevue Hospital and three in the out-patient department of the New York Hospital. All were treated since January the 26th, 1907. In seven years continuous out-patient service I had not before this recognized a single case of carpal fracture, no doubt treating more than one during all that time as a simple sprain. If, however, any cases were overlooked in the last five years it was due to the fact that they were not considered of sufficient importance to have them radiographed, for it has been the routine custom at the New York Hospital to X-ray and keep a record of the findings of all cases of suspected frac-

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ture since 1902. The same custom is in vogue at Bellevue and the same criticism holds good.

The cases followed closely one upon the other, a number being under observation at the same time. A positive diagnosis was made in four of the cases with little difficulty, and in two the condition was strongly suspected. In the other case (No. VII) the patient had been treated for a Colles fracture for four weeks before coming under our care, and the fractured scaphoid was accidentally discovered by the X-ray; the radius had not been fractured. The ages of the patients ranged from thirteen to forty-six years and the injury was received in each case, save one, by falling on the extended hand. The single exception (Case I) fell from his truck and is sure that he struck on the back of the flexed wrist, although there was no ecchymosis or sign of contusion. All of the patients were males. The left wrist was the seat of the injury five times and the right twice.

A remarkable feature of Case IV is the fact that the X-ray picture shows a fracture of both scaphoids. This patient received an injury to the left wrist by falling from a scaffold the day before admission, but did not in any way injure the right; however, he recalled upon being questioned, having injured his right wrist some six or seven years before while attempting to move a heavy stone. The injury was treated as a sprain and nothing more was thought of it until he began to work as an electrician two years ago. At that time he found the right hand much weaker than the left, and that he favored it in all efforts requiring rotation or extension. Case VI, aged thirteen, is so far as I can find out, the youngest yet recorded. Case VII was not seen until four weeks after the injury, the others were treated in from one to twenty-four hours after being hurt. In Cases III, V and VI, as shown by the radiograph, there was practically no displacement of the fragments, and in only one case (No. IV) was the displacement marked.

The line of fracture was in the middle third in six cases and at the junction of the middle and proximal thirds in one.

In so far as we could determine from examination of the patients and X-ray photographs none of the other carpal bones was fractured, nor was there dislocation of the semilunar bone.

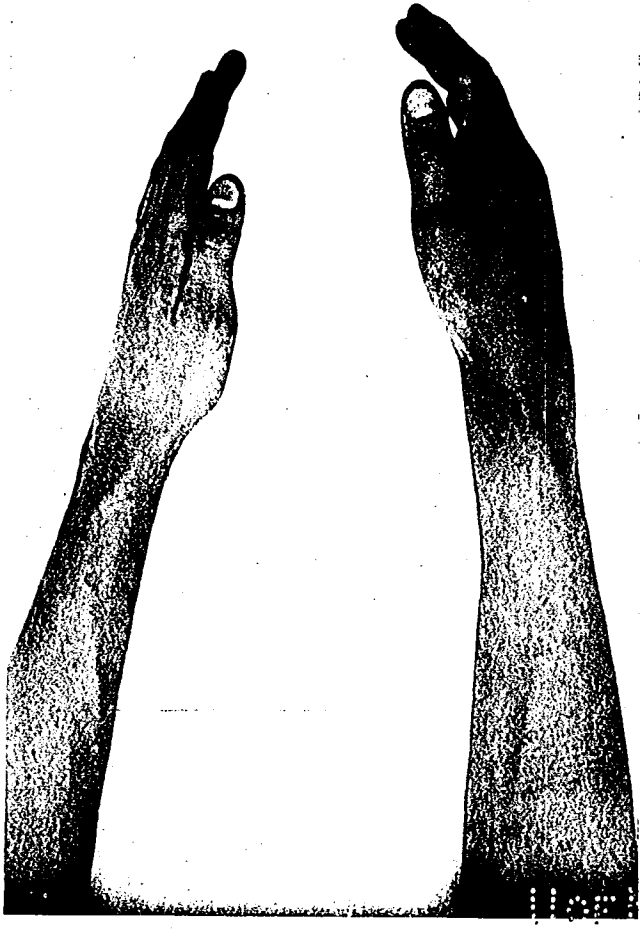
The immediate symptoms of fracture of the carpal scaphoid are very similar to those of a sprained wrist, *viz.*, there is a history of a fall on the extended hand (6 out of 7 cases) followed by pain, swelling and disability. In each of our cases one or all of these symptoms were so severe that the patient sought advice in less than twenty-four hours. The pain was intense immediately after the injury, but in most of the cases had subsided so that the patients were fairly comfortable on admission. The hand was held rigid, and this undoubtedly accounted for the quiescence of the pain, motion in any direction, however, caused it to recur, especially any effort at extension either active or passive. In fact, extension was limited in each instance to a few degrees, while flexion was permitted in from fifteen to thirty degrees.

The swelling followed the injury quickly and was more marked on the dorsal aspect and radial side of the wrist. In only one case (No. I) was it extensive. A photograph of Case VI, taken twenty-four hours after the injury, shows the average amount of swelling and the absence of any apparent bony deformity. (Fig. I.)

The disability is about what would be expected when the nature of the injury is taken into consideration—loss of power to grasp an object or inability to perform any function requiring an effort at extension or rotation.

Upon examination it will be found that the swelling is mostly on the radial side of the wrist, that the ulnar and radial styloids are normal in their relations and that pressure over the middle of the scaphoid, with the hand slightly flexed and adducted, causes exquisite pain. This tender point with the pain upon efforts at extension are the two most characteristic symptoms. Ecchymosis was not present in any case—either immediate or late. Crepitus was obtained in two cases (Nos. I and III), and it was due to this fact that the diagnosis in the first case was so readily made. This sign was elicited in Case

FIG. 1.



Photograph of Case VI twenty-four hours after injury.

I by my associates at Bellevue, Drs. Garrigan and Cramp, as well as myself, and was easily detected without undue pain and in spite of the unusual swelling which was present in this case. I do not believe that it is necessary by any means to obtain crepitus in order to make the diagnosis, nor do I think it wise to use force in trying to get it, for any undue manipulation may displace one of the fragments, thereby jeopardizing the chances of obtaining a good result.

The diagnosis of simple fracture of the scaphoid should be made in the majority of cases without much difficulty. The history of a fall on the extended hand, the swelling along the radial side and dorsal surface of the wrist, the localized point of tenderness below and to the dorsal side of the radial styloid and the extreme pain when any attempt is made to extend the wrist, form a symptom complex which makes the recognition of this condition fairly certain. If to the above we add crepitus, little doubt remains. Finally every case of injury around the wrist joint, of sufficient severity to cause the patient to seek advice, should be radiographed. This should be done not only to verify the diagnosis, but it is of great value in giving the prognosis, as the amount of separation or displacement of the fragments govern the final result.

I agree with the statement of Codman and Chase in their splendid article on this subject, that it is not necessary to give ether in order to make the diagnosis, but that we should depend upon the clinical symptoms and X-ray findings. Resort to anæsthesia should be made only in those cases where some complication exists, as dislocation of a fragment or the semilunar bone or both and then for purposes of reduction.

In cases of sprain the tenderness is not so marked, the swelling is apt to be more evenly distributed and efforts at extension are not so painful.

In fractures of the lower end of the radius the swelling extends much higher on the forearm, the point of tenderness is above the level of the styloid processes and usually there is the characteristic deformity of Colles fracture. Occasionally, however, we see fractures of the lower end of the radius with-

out deformity, and here the point of tenderness is of most diagnostic value.

The suggestion of Codman and Chase that both hands be radiographed on the same plate has been adopted and has proven of great assistance in that it has helped to properly interpret the plates. The uninjured carpus acts as a guide, as by it we can get a better idea of the location of the fracture, the amount of displacement in the fragments, etc.; furthermore, the question of a bipartite bone is settled. In six of the cases the uninjured scaphoid corresponds in every particular with the normal. The seventh is the case in which there had been an injury to the other hand six or seven years before. That both scaphoids have been fractured in this case there can be no doubt, as the radiograph shows plainly the line of fracture and the displaced proximal fragment in the recently injured side, and in the old injury it shows that the distal fragment has apparently turned and is lying at a right angle to the normal axis of the bone. The radiographs should be taken in two planes, anteroposterior and lateral and several should be made in order to avoid mistakes. If the patient can adduct the hand (ulnar flexion) without too much pain, it is better to have the anterior exposure made with the hand in this position as it gives a much clearer view of the scaphoid.

The treatment for simple fracture of the carpal scaphoid in the recent state, with the exception of those cases in which there is considerable displacement or dislocation of a fragment, should be immobilization with the hand straight. Fixation is best accomplished by means of moulded plaster splints extending to the bases of the fingers. A small pad of gauze was placed over the dorsal aspect of the bone, and held in position by adhesive plaster, in each of our cases before the splints were applied, it seemed to exert pressure just where the swelling was most marked and probably helped hold the fragments firm. Fixation should be employed in every case as soon as the clinical diagnosis is made, if the radiograph does not confirm the diagnosis no harm is done, but if on the other hand the fracture is found, much good will have been accomplished.

The fingers should be moved freely from the outset. Once a week the splints should be readjusted and at the end of the third week they should be removed for fifteen minutes daily and the wrist gently massaged; after the fourth week the splints are discarded and a snug bandage is worn as a support from two to three weeks. At the end of this time the hand will be fairly strong, but the tenderness in the region of the anatomical snuff box and the pain on forced extension will persist for some weeks longer.

In the cases where there is marked displacement or dislocation of a fragment and correction cannot be made under anæsthesia, one or both fragments should be removed without delay. If the displacement is not too great, an attempt to adjust the fragments by varying the position of the hand, and noting the result with the fluoroscope, would be worth trying before proceeding radically.

The final result will depend upon the position of the fragments, the presence or absence of complications and upon the length of time that elapses after the injury is received until the wrist joint is immobilized. In three of the cases (III, V and VI) there was very little separation and no displacement of the fragments and in each the result has been practically perfect. In one (Case II) the separation was greater and the line of fracture more uneven than in the above, and while the result can be classed as very good, yet there is limitation of extension to about one-half normal. In every other respect the outcome in this case is the same as in Cases III, V and VI. In the fifth and final case which I have been able to trace (No. IV), the result is by no means so satisfactory. The radiograph of this case, taken twenty-four hours after the injury, showed considerable inward displacement of the proximal fragment, and it is evident from a recent examination and radiograph (five months after the injury) that union has occurred with faulty position.

As I look back on this case, it would no doubt have been wiser to have removed the proximal fragment at the outset. Such a course has been advised if improvement does not take

place in the next two months. If union is very firm, the entire bone may have to be sacrificed.

CONCLUSIONS.

1. Simple fracture of the carpal scaphoid is caused as a rule by a fall of moderate height (3 to 7 ft. in this series) on the extended hand.

2. This form of fracture is more apt to be overlooked than the complicated type on account of the absence of deformity and the resemblance it bears to a sprained wrist.

3. Exquisite tenderness on pressure with the wrist slightly flexed and adducted, just below and to the dorsal side of the radial styloid, with extreme pain on any effort at extension, are the two most characteristic symptoms.

4. Union will take place provided the fractured surfaces are in contact and the wrist is immobilized for from three to four weeks.

5. The final result, under proper treatment, will depend upon the amount of separation or displacement of the fragments. In cases where the position of the fragments is good the result should be practically perfect.

6. If there is dislocation or considerable displacement of a fragment which cannot be corrected, one or both fragments should be removed without delay.

For the radiographs of the cases I am indebted to my friends Drs. A. H. Busby and J. H. Kenyon.

CLINICAL RECORDS.

CASE I.—D. W., male; aged forty-one years; driver. Admitted to O. P. D. Bellevue Hospital January 26, 1907, with a history of having fallen from the seat of his wagon the day before. He says that his hand turned under him and that the force of the fall came on the back of the wrist. Pain and disability immediate, swelling gradual. Upon examination eighteen hours after the injury the swelling was very marked, extending for a considerable distance up the arm, and was double the amount present in any of the cases that followed. No ecchymosis. Flexion to 20 degrees. Extension, abduction and adduction

caused intense pain and were limited to a few degrees. Marked tenderness in the scaphoid region. Crepitus obtained without undue force. Diagnosis of fracture of the scaphoid made and confirmed by the X-ray. The radiograph showed the fracture to be in the outer portion of the middle third of the bone and the fragments to be in fairly good position. Moulded plaster splints extending to the bases of the fingers with a pad over the scaphoid. Splints readjusted at the end of the first and second weeks. Massage for fifteen minutes every other day after third week. Plaster left off at end of the fourth week. This case was examined on March 9th, six weeks after the injury, and the fragments seemed to be united. There was moderate tenderness over the scaphoid and extension was painful, but there was fair motion in all directions. The patient had returned to his work as a driver and was pleased with the result. Repeated efforts to find this man for a final examination and X-ray have failed.

CASE II.—F. K., male; aged twenty-seven years; driver. Admitted to O. P. D. Bellevue February 28, 1907. About two hours before coming to the hospital he had slipped from the ice-covered foot board of his wagon falling on the extended left hand. There was immediate pain and disability followed by swelling. Examination showed moderate swelling in the scaphoid region. Pressure in the anatomical snuff box elicited the characteristic point of tenderness. All efforts at motion caused extreme pain. Ecchymosis and crepitus absent. In view of the history and having in mind the preceding case, the diagnosis of simple scaphoid fracture was made and confirmed by the X-ray. The fracture was just distal to the middle of the bone and there was moderate separation of the fragments. The treatment was carried out as in the first case except that the splints were left off about the middle of the fourth week. This man returned to work in six weeks though there was still some swelling and tenderness and limitation of all motion to about one half normal. Examination September 11th, six months after the injury, shows normal flexion, adduction and abduction, but extension is limited to half the normal. There is no tenderness on pressure over the scaphoid, nor is there pain or muscular spasm when the hand is forcibly extended. Extension seems to be limited by the slight thickening in the region of the scaphoid. There is just the least fullness below the tip of the radial styloid, other-

wise the appearance of the two hands is the same. Radiograph taken September 1, 1907, shows the bone to be shorter than the opposite one, due to slight overlapping of the fragments, union, however, has taken place. This man is working every day, has no pain or discomfort and says he considers his left hand as well and strong as the right.

CASE III.—J. McK., male; aged twenty-six years; driver. Admitted to the accident ward of the New York Hospital March 14, 1907, with a history of having fallen a short time before upon his extended left hand. He was pulling on a rope when it broke and he fell from his wagon to the street, a distance of about five feet. Was treated by Dr. Truesdell of the House Staff who made a probable diagnosis of fractured scaphoid and applied moulded splints. The case was referred to the O. P. D. on the following morning. Upon examination the swelling was slight, due, no doubt, to early fixation of the joint. The pain on any attempt at motion and the tenderness over the scaphoid were present. No ecchymosis. Crepitus was obtained in this case, the second and last one of the series in which it was present. X-ray verified the diagnosis. The fracture was at the middle of the bone and there was practically no displacement of the fragments. Treatment as outlined except that this patient did not return after the third week, consequently had no massage. He removed the plaster himself and went to work on the twenty-eighth day. I examined him and had an X-ray taken on September 1, 1907. It was with difficulty that I could tell which hand had been injured, so good has been the result. The range of motion is normal and there is no tenderness over the scaphoid or pain on hyper-extension. There is no fullness in the region of the anatomical snuff box. The recent radiograph shows distinctly the line of fracture. Union is complete with the fragments in perfect position. This patient is following his occupation as a driver and uses the left hand every bit as well as before he was injured.

CASE IV.—A. R., male; aged twenty-one years; electrician. Admitted to the O. P. D. New York Hospital March 27, 1907. On the afternoon before he had fallen from a scaffold seven feet high, receiving the weight of the fall on the palm of his left hand. There were the usual symptoms which go with a severe injury to the wrist and the physician who saw him immediately after the

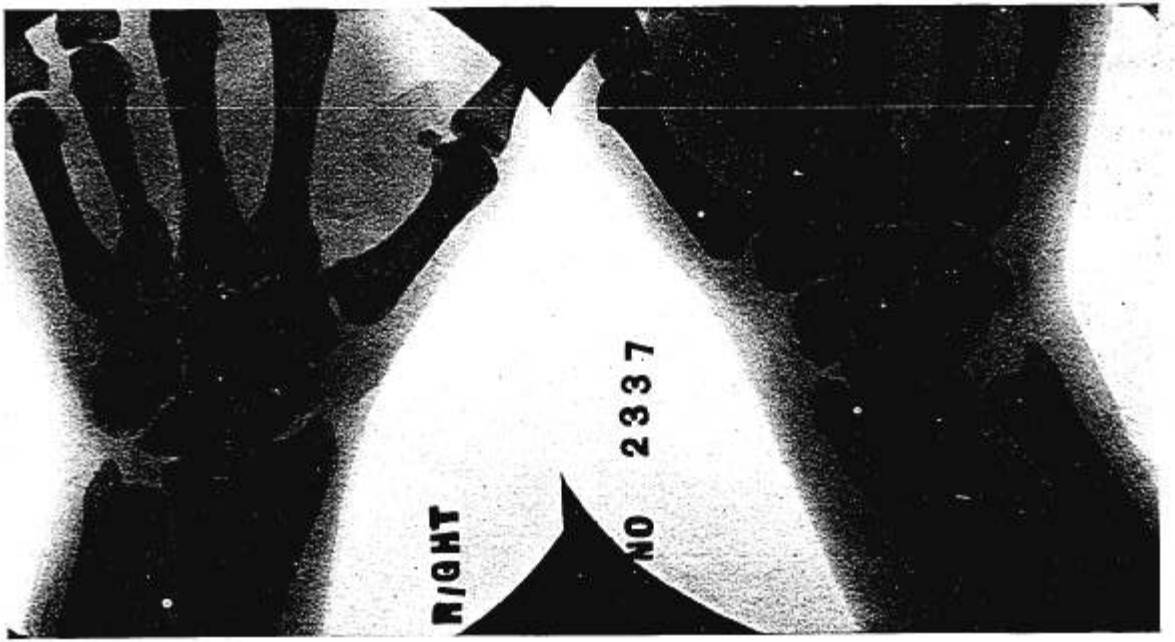
accident treated the case as a fracture of the lower end of the radius. Upon examination at the dispensary we found the swelling moderate and confined almost entirely to the dorsal surface of the radial half of the joint. The slightest motion caused exquisite pain, in fact this patient complained more bitterly of the pain than any of the others, consequently it was difficult to make a very complete examination. The tenderness was not localized as in the other cases, but involved the radial half of the carpus. Injury to the radius was ruled out and a diagnosis of fractured scaphoid, with probable injury to some other carpal bone, made. The radiograph showed only a transverse fracture of the scaphoid at the junction of the middle and proximal thirds, with median displacement of the proximal fragment. Moulded splints with gauze pad applied in the usual way and massage given after the third week. The symptoms at the end of six weeks had not improved as in the other cases; the swelling had disappeared only partially, the pain on extension beyond five or ten degrees and on flexion more than twenty degrees was severe and there was marked tenderness over the inner half of the scaphoid. For one reason or another I did not see him for three months after this, in the meantime he had resumed his work, but the pain and partial disability were such that he could not do satisfactory work and he again consulted me. The condition had improved considerably since I last saw him, however, the fullness over the scaphoid the limitation of motion to about half the normal and some tenderness were still present. Examination September 18th, showed very little change. According to the radiograph taken August 28th, there is union, but the position of the fragments is bad. This is the case in which the opposite scaphoid (right) had been fractured, some years before, the discovery of which was accidentally made by taking a radiograph of the two hands. Examination of the right hand shows that extension cannot be carried beyond a straight line, all other motions, however, are normal. There is a slight atrophy in the region of the anatomical snuff box and with the hand completely flexed there is a distinct depression at this point. According to my interpretation of the X-ray the distal fragment has rotated and a false articulation has resulted.

CASE V.—A. E., male; aged twenty-nine years; carpenter. Admitted to the O. P. D. New York Hospital April 10th, twelve

hours after falling from a moving street car. As he fell he put out his left hand to save himself and the force of the fall came on the palm. The pain and discomfort were only moderate and not until the following morning did he seek treatment. On examination the swelling was of the average amount and in the usual situation. Flexion, abduction and adduction were permitted to a greater extent than in any of the other cases. Intense pain, however, was caused by pressure in the anatomical snuff box and on the strength of this with the limitation of extension a probable diagnosis of fracture of the scaphoid was made. The X-ray taken on the following day showed an irregular line of fracture, the outer portion situated just at the tubercle, is roughened, while the inner half is smooth. Same treatment applied as in the other cases. Patient discharged at the end of fifth week. All symptoms, except pain on forced extension and moderate tenderness in the snuff box, had disappeared. Examination and X-ray September 13th show the wrist to be practically normal. In the radiograph the inner half of the line fracture can be made out. Union is complete. This man works at his trade every day and says there is no difference in the two hands.

CASE VI.—W. C., male; aged thirteen years; office boy. Admitted to the O. P. D. Bellevue Hospital April 25, 1907, with the history of having fallen from a ladder upon the extended right hand one hour before. Distance of fall about five feet. The pain was intense and it was for the relief of this symptom that the boy sought treatment. Swelling moderate and about the same as is shown in the photograph taken twenty-four hours after the injury (Fig. 1). On account of the pain the wrist was handled very little. Motion was very slight and the disability complete. Fracture of the scaphoid was considered the most likely diagnosis, but on account of the boy's age no one would venture a positive opinion. The radiograph (Fig. 3) showed a fracture running obliquely in the outer portion of the middle third of the bone. The wrist was immobilized and treated as outlined above. Splints removed after the third week. I examined this boy August 19th, four months after the injury and the wrist seemed normal in every particular. No pain, no tenderness and no limitation of motion. X-ray taken at this time gives the bone the appearance of being a little denser along the line of fracture than the normal. Union perfect.

FIG. 2.



CASE IV.—Recent fracture, left scaphoid. Old fracture of right. Radiograph at time of recent fracture.

FIG. 3.

CASE VI.—Fracture right scaphoid. Radiograph at time of injury.

CASE VII.—J. F., male; aged forty-six years; hostler. Admitted to Out-Patient Department Bellevue, April 25, 1907. Four weeks before he had slipped upon the sidewalk and fallen on the extended left hand. He was treated for a Colles' fracture in one of the larger hospitals of this city, but was not satisfied with the result. The wrist was swollen and had the appearance of a case of sub-acute arthritis. Motion was limited to a few degrees of flexion. There was tenderness over the entire carpus, due, no doubt, to the force which had been used the day before in an attempt to break up adhesions. The fingers were held in extension and could be only slightly flexed. Disability complete. No diagnosis was made, but the radiograph showed a transverse fracture at the middle of the scaphoid with displacement of a small fragment to the outer side. Massage and Bier's hyperæmia were begun on this patient and carried out for three days when his visits to the dispensary ceased. We have since been unable to locate him.

[Since writing this paper three additional cases of simple fracture in the recent state have come under my observation.]